

REMARKS

Claims 1, 3, 4, 11, 13, and 14 are rejected under the judicially created doctrine obviousness-type double patenting as being unpatentable over claims 1-24 of Lim et al., U.S. 6,751,368.

The Examiner's rejection is respectfully traversed.

Independent claims 1 and 11 have now been amended to respectively recite a deformable membrane structure that can experience strain using a plurality of thin-film actuators. The strain is continuous in the strain direction. The deformable membrane provides mechanical support for the microphotonic device while providing high dielectric contrast with air underneath the deformable membrane.

It is respectfully noted that Lim et al. '368 does not recite thin-film actuators, the stress member providing support to the microphotonic device and providing high dielectric contrast. Applicants request that the Examiner reconsider this rejection.

Claims 1, 3, 11, and 13 are rejected under 35 USC §102(a) as being anticipated by Lim et al., WO 02/25338.

Independent claim 1 has now been amended to recite a microphotonic device that includes a deformable membrane structure that can experience strain using a plurality of thin-film actuators. The strain is continuous in the strain direction. The deformable membrane provides mechanical support for the microphotonic device while providing high dielectric contrast with air underneath the deformable membrane. A waveguide element is formed on the deformable membrane structure so that when the deformable membrane structure is strained, the

waveguide element is tuned to a selective amount. In addition, independent claim 11 is a method claim associated with the device claim 1.

Lim et al. '338 describes techniques for tuning, switching or modulating, or, in general, changing the resonance of waveguide micro-resonators. Changes in the resonance can be brought about, permanently or temporarily, by changing the size of the micro-resonator with precision, by changing the local physical structure of the device or by changing the effective and group indices of refraction of the mode in the micro-resonator.

The designs shown in Lim et al '338 are not on a deformable membrane structure. They are attached onto a substrate and the stress field applied from the strain element. There is no discussion in Lim et al. '338 that their straining element provides support to their microphotonic structure. Also, Lim et al. '338 is silent on whether their straining element provides high dielectric contrast with air underneath their straining element. Importantly, the present invention shows the usage of a deformable membrane in order to tune various microphotonic elements. Furthermore, Lim et al. '338 is silent on a waveguide being formed on the deformable membrane. Lim describes manipulating various parameters of a resonator but there is no discussion forming a waveguide on a deformable element for tuning. Therefore, Lim et al '338 does not anticipate either of claims 1 or 11.

As to claims 3 and 13, they are dependent on claims 1 and 11, respectively. Therefore, claims 3 and 13 are also allowable for the same reasons argued with respect to claims 1 and 11.

Claims 1, 5-7, 10, 11, 15-17, and 20 are rejected under 35 USC §102(a) as being anticipated by Matsuura et al., WO 02/10843 A2.

Matsuura et al. '843 describes a photonic crystal and a photonic device having a photonic crystal, configured by changing its physical geometry in at least one region to alter light propagation and/or confinement. The configuring means may include electrostrictive, piezoelectric or magnetostrictive components of the photonic crystal, or an actuation device affixed to the photonic crystal.

However, Matsuura et al. '843 describes photonic crystals and supports which have piezoelectric effects. In contrast, the invention has photonic crystals and microphotonic elements that do not exhibit piezoelectric effects, and are furthermore not bonded to the supports that exhibit piezoelectric effects. The deformable membrane structure of the invention comprises a semiconductor material without requiring the need for piezoelectric effects. The requirement is that the piezoelectric materials are attached to the membrane structure, and the flexibility of the membrane. The top portion of the membrane includes multiple microphotonic elements. Furthermore, Matsuura et al. '843 is silent on a waveguide being formed on the deformable membrane. Matsuura et al. '843 describes configuring by changing a photonic crystal's physical geometry in at least one region to alter light propagation and/or confinement, but there is no discussion forming a waveguide on a deformable element for tuning. Therefore, Matsuura et al. '843 does not anticipate either of claims 1 or 11.

As to claims 5-7, 10, 15-17, and 20, they are dependent on claims 1 and 11, respectively. Therefore, claims 5-7, 10, 15-17, and 20 are also allowable for the same reasons argued with respect to claims 1 and 11.

Claims 4 and 14 are rejected under 35 USC §103 as being unpatentable over Lim et al. '338 in view of Scheuer et al., US 2004/0008942.

Scheuer et al. '942 describes a resonator structure comprising a closed loop resonator waveguide having a width varying over the circumferential region of the resonator waveguide.

Given that claims 4 and 14 are dependent on claims 1 and 11, the reasons argued for claims 1 and 11 are also applicable here. Also, Scheuer et al. '942 does not address the deficiencies of Lim et al. '338. Therefore, the proposed combination of Lim et al. '338 and Scheuer et al. '942 does not render obvious claims 4 and 14.

Claims 8, 9, 18 and 19 are rejected under 35 USC §103 as being unpatentable over Matsuura et al. '843.

Given that claims 8, 9, 18 and 19 are dependent on claims 1 and 11, the reasons argued for claims 1 and 11 are also applicable here. Also, the additional limitations of claims 8, 9, 18 and 19 further limit the inventive concept not taught by Matsuura et al. Therefore, Matsuura et al. '843 does not render obvious claims 8, 9, 18 and 19.

In view of the above amendments and for all the reasons set forth above, the Examiner is respectfully requested to reconsider and withdraw the objections and rejections made under 35 U.S.C. §§ 102 and 103. Accordingly, an early indication of allowability is earnestly solicited.

If the Examiner has any questions regarding matters pending in this application, please feel free to contact the undersigned below.

Respectfully submitted,



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